

DOI: 10.1038/s41467-017-01008-2

OPEN

# Erratum: Large meta-analysis of genome-wide association studies identifies five loci for lean body mass

M. Carola Zillikens

*Nature Communications* 8:80 doi:[10.1038/s41467-017-00031-7](https://doi.org/10.1038/s41467-017-00031-7); Article published online 19 Jul 2017

The previously published version of this Article contained typographical errors in the spelling of the author names Stephen C. J. Parker and H.-Erich Wichmann, which were incorrectly given as Stephan Parker and H.-Erich Wichman, respectively. Furthermore, Affiliation 53 was incorrectly given as ‘Research Group on Geriatrics, The Berlin Aging Study II, Charité–Universitätsmedizin Berlin, Berlin 13353, Germany’, Affiliation 66 was incorrectly given as ‘Department of Botany & Plant Sciences, Institute for Integrative Genome Biology, University of California, Riverside, CA 92521, USA’, and Affiliation 152 was incorrectly given as ‘Group Health Research Institute, Group Health Cooperative, Seattle, WA 98101, USA’. These errors have been corrected in the PDF and HTML versions of the Article.

Published online: 07 November 2017



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2017

M. Carola Zillikens<sup>1,2</sup>, Serkalem Demissie<sup>3</sup>, Yi-Hsiang Hsu<sup>4,5,6</sup>, Laura M. Yerges-Armstrong<sup>7</sup>, Wen-Chi Chou<sup>4,5,8</sup>, Lisette Stolk<sup>1,2</sup>, Gregory Livshits<sup>9,10</sup>, Linda Broer<sup>11</sup>, Toby Johnson<sup>12,13,14</sup>, Daniel L. Koller<sup>15</sup>, Zoltán Kutalik<sup>12,13,14</sup>, Jian'an Luan<sup>16</sup>, Ida Malkin<sup>9</sup>, Janina S. Ried<sup>17</sup>, Albert V. Smith<sup>18,19</sup>, Gudmar Thorleifsson<sup>20</sup>, Liesbeth Vandenput<sup>21</sup>, Jing Hua Zhao<sup>16</sup>, Weihua Zhang<sup>22,23</sup>, Ali Aghdassi<sup>24</sup>, Kristina Åkesson<sup>25,26</sup>, Najaf Amin<sup>11</sup>, Leslie J. Baier<sup>27</sup>, Inês Barroso<sup>28,29,30</sup>, David A. Bennett<sup>31</sup>, Lars Bertram<sup>32,33</sup>, Rainer Biffar<sup>34</sup>, Murielle Bochud<sup>14</sup>, Michael Boehnke<sup>35</sup>, Ingrid B. Borecki<sup>36,37</sup>, Aron S. Buchman<sup>31</sup>, Liisa Byberg<sup>38</sup>, Harry Campbell<sup>39</sup>, Natalia Campos Obanda<sup>1</sup>, Jane A. Cauley<sup>40</sup>, Peggy M. Cawthon<sup>41</sup>, Henna Cederberg<sup>42</sup>, Zhao Chen<sup>43</sup>, Nam H. Cho<sup>44</sup>, Hyung Jin Choi<sup>45,46</sup>, Melina Claussnitzer<sup>4,5,8,47,48,49</sup>, Francis Collins<sup>50</sup>, Steven R. Cummings<sup>41</sup>, Philip L. De Jager<sup>5,51,52</sup>, Ilja Demuth<sup>53,54</sup>, Rosalie A.M. Dhonukshe-Rutten<sup>55</sup>, Luda Diatchenko<sup>56,57</sup>, Gudny Eiriksdottir<sup>18</sup>, Anke W. Enneman<sup>1</sup>, Mike Erdos<sup>50</sup>, Johan G. Eriksson<sup>58,59,60,61,62</sup>, Joel Eriksson<sup>21</sup>, Karol Estrada<sup>1,11</sup>,

Daniel S. Evans<sup>41</sup>, Mary F. Feitosa<sup>36</sup>, Mao Fu<sup>7</sup>, Melissa Garcia<sup>63</sup>, Christian Gieger<sup>17,64,65</sup>, Thomas Gierke<sup>66,67</sup>, Nicole L. Glazer<sup>68</sup>, Harald Grallert<sup>17,67,64,69,70,71</sup>, Jagvir Grewal<sup>23,72</sup>, Bok-Ghee Han<sup>73</sup>, Robert L. Hanson<sup>27</sup>, Caroline Hayward<sup>74</sup>, Albert Hofman<sup>2,11</sup>, Eric P. Hoffman<sup>75</sup>, Georg Homuth<sup>76</sup>, Wen-Chi Hsueh<sup>27</sup>, Monica J. Hubal<sup>77,78</sup>, Alan Hubbard<sup>79</sup>, Kim M. Huffman<sup>80</sup>, Lise B. Husted<sup>81</sup>, Thomas Illig<sup>64,82,83</sup>, Erik Ingelsson<sup>84,85</sup>, Till Ittermann<sup>86</sup>, John-Olov Jansson<sup>87</sup>, Joanne M. Jordan<sup>88</sup>, Antti Jula<sup>62</sup>, Magnus Karlsson<sup>89</sup>, Kay-Tee Khaw<sup>90</sup>, Tuomas O. Kilpeläinen<sup>16,91,92</sup>, Norman Klopp<sup>64,83</sup>, Jacqueline S.L. Kloth<sup>1</sup>, Heikki A. Koistinen<sup>93,94,95,96</sup>, William E. Kraus<sup>97</sup>, Stephen Kritchevsky<sup>98</sup>, Teemu Kuulasmaa<sup>42</sup>, Johanna Kuusisto<sup>42</sup>, Markku Laakso<sup>42</sup>, Jari Lahti<sup>99</sup>, Thomas Lang<sup>100</sup>, Bente L. Langdahl<sup>81</sup>, Lenore J. Launer<sup>63</sup>, Jong-Young Lee<sup>73</sup>, Markus M. Lerch<sup>24</sup>, Joshua R. Lewis<sup>101,102</sup>, Lars Lind<sup>84</sup>, Cecilia Lindgren<sup>103</sup>, Yongmei Liu<sup>104</sup>, Tian Liu<sup>105,106</sup>, Youfang Liu<sup>88</sup>, Östen Ljunggren<sup>84</sup>, Mattias Lorentzon<sup>21</sup>, Robert N. Luben<sup>90</sup>, William Maixner<sup>57</sup>, Fiona E. McGuigan<sup>25</sup>, Carolina Medina-Gomez<sup>1,11</sup>, Thomas Meitinger<sup>48,107</sup>, Håkan Melhus<sup>84</sup>, Dan Mellström<sup>21</sup>, Simon Melov<sup>108,109</sup>, Karl Michaëlsson<sup>38</sup>, Braxton D. Mitchell<sup>7,110</sup>, Andrew P. Morris<sup>103,111</sup>, Leif Mosekilde<sup>81</sup>, Anne Newman<sup>112</sup>, Carrie M. Nielson<sup>113</sup>, Jeffrey R. O'Connell<sup>7</sup>, Ben A. Oostra<sup>114,115</sup>, Eric S. Orwoll<sup>113</sup>, Aarno Palotie<sup>116,117</sup>, Stephen C.J. Parker<sup>118</sup>, Munro Peacock<sup>119</sup>, Markus Perola<sup>62,116,120,121</sup>, Annette Peters<sup>17,64</sup>, Ozren Polasek<sup>122</sup>, Richard L. Prince<sup>101,123</sup>, Katri Räikkönen<sup>99</sup>, Stuart H. Ralston<sup>124</sup>, Samuli Ripatti<sup>116,125,126</sup>, John A. Robbins<sup>127</sup>, Jerome I. Rotter<sup>128</sup>, Igor Rudan<sup>39</sup>, Veikko Salomaa<sup>62</sup>, Suzanne Satterfield<sup>129</sup>, Eric E. Schadt<sup>130</sup>, Sabine Schipf<sup>86</sup>, Laura Scott<sup>35</sup>, Joban Sehmi<sup>23,72</sup>, Jian Shen<sup>113</sup>, Chan Soo Shin<sup>45</sup>, Gunnar Sigurdsson<sup>19,131</sup>, Shad Smith<sup>132</sup>, Nicole Soranzo<sup>126</sup>, Alena Stančáková<sup>42</sup>, Elisabeth Steinhagen-Thiessen<sup>53</sup>, Elizabeth A. Streeten<sup>7,133</sup>, Unnur Styrkarsdottir<sup>20</sup>, Karin M.A. Swart<sup>134</sup>, Sian-Tsung Tan<sup>23,72</sup>, Mark A. Tarnopolsky<sup>135</sup>, Patricia Thompson<sup>136</sup>, Cynthia A. Thomson<sup>43</sup>, Unnur Thorsteinsdottir<sup>19,20</sup>, Emmi Tikkanen<sup>62,116,124</sup>, Gregory J. Tranah<sup>41</sup>, Jaakko Tuomilehto<sup>61,137,138,139</sup>, Natasja M. van Schoor<sup>134</sup>, Arjun Verma<sup>23</sup>, Peter Vollenweider<sup>140</sup>, Henry Völzke<sup>86</sup>, Jean Wactawski-Wende<sup>141</sup>, Mark Walker<sup>142</sup>, Michael N. Weedon<sup>143</sup>, Ryan Welch<sup>35</sup>, H.-Erich Wichmann<sup>17,144,145</sup>, Elisabeth Widen<sup>116</sup>, Frances M.K. Williams<sup>10</sup>, James F. Wilson<sup>39,74</sup>, Nicole C. Wright<sup>146</sup>, Weijia Xie<sup>143</sup>, Lei Yu<sup>31</sup>, Yanhua Zhou<sup>3</sup>, John C. Chambers<sup>22,23,147,148</sup>, Angela Döring<sup>17,149</sup>, Cornelia M. van Duijn<sup>11,115</sup>, Michael J. Econs<sup>150</sup>, Vilundur Gudnason<sup>18,19</sup>, Jaspal S. Kooner<sup>23,72,148</sup>, Bruce M. Psaty<sup>151,152</sup>, Timothy D. Spector<sup>10</sup>, Kari Stefansson<sup>19,20</sup>, Fernando Rivadeneira<sup>1,2,11</sup>, André G. Uitterlinden<sup>1,2,11</sup>, Nicholas J. Wareham<sup>16</sup>, Vicky Ossowski<sup>27</sup>, Dawn Waterworth<sup>153</sup>, Ruth J.F. Loos<sup>16,154,155,156,157</sup>, David Karasik<sup>4,5,158</sup>, Tamara B. Harris<sup>63</sup>, Claes Ohlsson<sup>21</sup> & Douglas P. Kiel<sup>4,5,49</sup>

<sup>1</sup>Department of Internal Medicine, Erasmus MC, Rotterdam 3000, The Netherlands. <sup>2</sup>Netherlands Genomics Initiative (NGI)-sponsored Netherlands Consortium for Healthy Aging (NCHA), Leiden 2593, The Netherlands. <sup>3</sup>Department of Biostatistics, Boston University School of Public Health, Boston, MA 02118, USA. <sup>4</sup>Hebrew SeniorLife, Institute for Aging Research, Roslindale, MA 02131, USA. <sup>5</sup>Harvard Medical School, Boston, MA 02115, USA. <sup>6</sup>Molecular and Integrative Physiological Sciences Program, Harvard School of Public Health, Boston, MA 02115, USA. <sup>7</sup>Program in Personalized and Genomic Medicine, and Department of Medicine, Division of Endocrinology, Diabetes and Nutrition, University of Maryland School of Medicine, Baltimore, MD 21201, USA. <sup>8</sup>Broad Institute, Cambridge, MA 02142, USA. <sup>9</sup>Sackler Faculty of Medicine, Department of Anatomy and Anthropology, Tel Aviv University, Tel Aviv 6997801, Israel. <sup>10</sup>Department of Twin Research and Genetic Epidemiology, King's College London, St Thomas' Campus, London WC2R 2LS, UK. <sup>11</sup>Department of Epidemiology, Erasmus MC, Rotterdam 3000, The Netherlands. <sup>12</sup>Department of Medical Genetics, University of Lausanne, Lausanne 1011, Switzerland. <sup>13</sup>Swiss Institute of Bioinformatics, Lausanne 1015, Switzerland. <sup>14</sup>Centre Hospitalier Universitaire (CHUV), University Institute for Social and Preventive Medicine, Lausanne 1010, Switzerland. <sup>15</sup>Department of Medical and Molecular Genetics, Indiana University School of Medicine, Indianapolis, IN 46202, USA. <sup>16</sup>MRC Epidemiology Unit, University of Cambridge School of Clinical Medicine, Cambridge Biomedical Campus, Cambridge CB2 0QQ, UK. <sup>17</sup>Institute of Epidemiology II, Helmholtz Zentrum München – German Research Center for Environmental Health, Neuherberg 85764, Germany. <sup>18</sup>Icelandic Heart Association, Kopavogur 201, Iceland. <sup>19</sup>Faculty of Medicine, University of Iceland, Reykjavik 101, Iceland. <sup>20</sup>deCODE Genetics, Reykjavik 101, Iceland. <sup>21</sup>Department of Internal Medicine, Institute of Medicine, Sahlgrenska Academy, University of Gothenburg, Gothenburg SE-405 30, Sweden. <sup>22</sup>Department Epidemiology and Biostatistics, School of Public Health, Imperial College, London SW7 2AZ, UK. <sup>23</sup>Cardiology Department, Ealing Hospital NHS Trust, Middlesex UB1 3HW, UK. <sup>24</sup>Department of Medicine A, University of Greifswald, Greifswald 17489, Germany. <sup>25</sup>Department of Clinical Sciences, Lund University, Malmö 22362, Sweden. <sup>26</sup>Department of Orthopedics, Skåne University Hospital, Malmö S-205 02, Sweden. <sup>27</sup>Phoenix Epidemiology and Clinical Research Branch, National Institute of Diabetes and Digestive and Kidney Diseases, NIH, Phoenix, AZ 85014, USA. <sup>28</sup>Wellcome Trust Sanger Institute, Wellcome Trust Genome Campus, Hinxton CB10 1SA, UK. <sup>29</sup>NIHR Cambridge Biomedical Research Centre, Institute of Metabolic Science, Addenbrooke's Hospital, Cambridge CB2 0QQ, UK. <sup>30</sup>Institute of Metabolic Science, Addenbrooke's

Hospital, University of Cambridge Metabolic Research Laboratories, Cambridge CB2 0QQ, UK. <sup>31</sup>Rush Alzheimer's Disease Center, Rush University Medical Center, Chicago, IL 60612, USA. <sup>32</sup>Lübeck Interdisciplinary Platform for Genome Analytics, Institutes of Neurogenetics and Experimental & Integrative Genomics, University of Lübeck, Lübeck 23562, Germany. <sup>33</sup>School of Public Health, Faculty of Medicine, Imperial College London, London W6 8RP, UK. <sup>34</sup>Centre of Oral Health, Department of Prosthetic Dentistry, Gerodontology and Biomaterials, University of Greifswald, Greifswald 17489, Germany. <sup>35</sup>Department of Biostatistics and Center for Statistical Genetics, University of Michigan, Ann Arbor, MI 48109, USA. <sup>36</sup>Division of Statistical Genomics, Department of Genetics, Washington University School of Medicine, St Louis, MO 63110, USA. <sup>37</sup>Division of Biostatistics, Washington University School of Medicine, St Louis, MO 63110, USA. <sup>38</sup>Department of Surgical Sciences, Uppsala University, Uppsala 75185, Sweden. <sup>39</sup>Usher Institute of Population Health Sciences and Informatics, University of Edinburgh, Edinburgh, Scotland EH8 9AG, UK. <sup>40</sup>Department of Epidemiology Graduate School of Public Health, University of Pittsburgh, Pittsburgh, PA 15261, USA. <sup>41</sup>California Pacific Medical Center Research Institute, San Francisco, CA 94107, USA. <sup>42</sup>Department of Medicine, University of Eastern Finland and Kuopio University Hospital, Kuopio 70210, Finland. <sup>43</sup>Mel and Enid Zuckerman College of Public Health, University of Arizona, Tucson, AZ 85714, USA. <sup>44</sup>Department of Preventive Medicine, Ajou University School of Medicine, Youngtong-Gu, Suwon 16499, Korea. <sup>45</sup>Department of Internal Medicine, Seoul National University College of Medicine, Seoul 03080, Korea. <sup>46</sup>Department of Internal Medicine, Chungbuk National University Hospital, Cheongju Si, Korea. <sup>47</sup>Computer Science and Artificial Intelligence Laboratory, MIT, Cambridge, MA 02139, USA. <sup>48</sup>Institute of Human Genetics, MRI, Technische Universität München, Munich 81675, Germany. <sup>49</sup>Beth Israel Deaconess Medical Center, Boston, MA 02215, USA. <sup>50</sup>Medical Genomics and Metabolic Genetics Branch, National Human Genome Research Institute, Bethesda, MD 20892, USA. <sup>51</sup>Program in Translational NeuroPsychiatric Genomics, Department of Neurology, Brigham and Women's Hospital, Boston, MA 02115, USA. <sup>52</sup>Program in Medical and Population Genetics, Broad Institute, Cambridge, MA 02142, USA. <sup>53</sup>Lipid Clinic at the Interdisciplinary Metabolism Center, Charité – Universitätsmedizin Berlin, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Berlin 13353, Germany. <sup>54</sup>Institute of Medical and Human Genetics, Charité – Universitätsmedizin Berlin, Berlin 13353, Germany. <sup>55</sup>Department of Human Nutrition, Wageningen University, PO Box 17, Wageningen 6700 AA, The Netherlands. <sup>56</sup>Alan Edwards Centre for Research on Pain, McGill University, Montreal, H3A 0G1, Canada. <sup>57</sup>Regional Center for Neurosensory Disorders, School of Dentistry, University of North Carolina at Chapel Hill, Chapel Hill, NC 27599, USA. <sup>58</sup>Department of General Practice and Primary Health Care, University of Helsinki, Helsinki 00014, Finland. <sup>59</sup>Unit of General Practice, Helsinki University Central Hospital, Helsinki 00014, Finland. <sup>60</sup>Folkhalsan Research Centre, Helsinki 00250, Finland. <sup>61</sup>Vasa Central Hospital, Vasa 65130, Finland. <sup>62</sup>National Institute for Health and Welfare, Helsinki 00271, Finland. <sup>63</sup>Laboratory of Epidemiology and Population Sciences, Intramural Research Program, National Institute for Aging, Bethesda, MD 20892, USA. <sup>64</sup>Research Unit of Molecular Epidemiology, Helmholtz Zentrum München – German Research Center for Environmental Health, Neuherberg 85764, Germany. <sup>65</sup>Institute of Genetic Epidemiology, Helmholtz Zentrum München – German Research Center for Environmental Health, Neuherberg 85764, Germany. <sup>66</sup>Institute for Integrative Genome Biology, University of California, Riverside, CA 92521, USA. <sup>67</sup>Department of Botany and Plant Sciences, University of California, Riverside, CA 92521, USA. <sup>68</sup>Departments of Medicine and Epidemiology, Boston University School of Medicine and Public Health, Boston, MA 02118, USA. <sup>69</sup>German Center for Diabetes Research (DZD), Neuherberg, Germany. <sup>70</sup>CCG Type 2 Diabetes, Helmholtz Zentrum München, Neuherberg 85764, Germany. <sup>71</sup>CCG Nutrigenomics and Type 2 Diabetes, Helmholtz Zentrum München, Neuherberg 85764, Germany. <sup>72</sup>National Heart and Lung Institute, Imperial College London, London SW3 6LY, UK. <sup>73</sup>Center for Genome Science, National Institute of Health, Osong Health Technology Administration Complex, Chungcheongbuk-do 28159, Korea. <sup>74</sup>MRC Human Genetics Unit, IGMM, University of Edinburgh, Edinburgh, Scotland EH4 2XU, UK. <sup>75</sup>Department of Pharmaceutical Sciences, SUNY Binghamton, Binghamton, NY 13902, USA. <sup>76</sup>Interfaculty Institute for Genetics and Functional Genomics, University of Greifswald, Greifswald 17487, Germany. <sup>77</sup>Department of Exercise and Nutrition Sciences, George Washington University, Washington, DC 20052, USA. <sup>78</sup>Research Center for Genetic Medicine, Children's National Medical Center, Washington, DC 20052, USA. <sup>79</sup>Division of Biostatistics, School of Public Health, University of California, Berkeley, CA 94720, USA. <sup>80</sup>Division of Rheumatology, Department of Medicine, Duke Molecular Physiology Institute, Duke University School of Medicine, Durham, NC 27710, USA. <sup>81</sup>Endocrinology and Internal Medicine, Aarhus University Hospital, Aarhus DK 8000, Denmark. <sup>82</sup>Department of Human Genetics, Hannover Medical School, Hannover 30625, Germany. <sup>83</sup>Hannover Unified Biobank, Hannover Medical School, Hannover 30625, Germany. <sup>84</sup>Department of Medical Sciences, Uppsala University, Uppsala 75185, Sweden. <sup>85</sup>Division of Cardiovascular Medicine, Department of Medicine, Stanford University School of Medicine, Stanford, CA 94305, USA. <sup>86</sup>Institute for Community Medicine, University of Greifswald, Greifswald 17489, Germany. <sup>87</sup>Department of Physiology, Institute of Neuroscience and Physiology, Sahlgrenska Academy, University of Gothenburg, Gothenburg SE 405 30, Sweden. <sup>88</sup>Thurston Arthritis Research Center, University of North Carolina at Chapel Hill, Chapel Hill, NC 27517, USA. <sup>89</sup>Department of Clinical Sciences and Orthopaedics, Lund University, Skåne University Hospital SUS, Malmö 22362, Sweden. <sup>90</sup>Department of Public Health and Primary Care, University of Cambridge, Cambridge CB1 8RN, UK. <sup>91</sup>The Novo Nordisk Foundation Center for Basic Metabolic Research, Section of Metabolic Genetics, University of Copenhagen, Copenhagen 2100, Denmark. <sup>92</sup>Department of Environmental Medicine and Public Health, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA. <sup>93</sup>Department of Medicine, University of Helsinki and Helsinki University Central Hospital, Helsinki 00029, Finland. <sup>94</sup>Endocrinology, Abdominal Center, University of Helsinki and Helsinki University Central Hospital, Helsinki 00029, Finland. <sup>95</sup>Department of Health, National Institute for Health and Welfare, Helsinki 00271, Finland. <sup>96</sup>Minerva Foundation Institute for Medical Research, Helsinki 00290, Finland. <sup>97</sup>Division of Cardiology, Department of Medicine, Duke Molecular Physiology Institute, Duke University School of Medicine, Durham, NC 27710, USA. <sup>98</sup>Sticht Center on Aging, Wake Forest School of Medicine, Winston-Salem, NC 27157, USA. <sup>99</sup>Institute of Behavioural Sciences, University of Helsinki, Helsinki FI00014, Finland. <sup>100</sup>University of California San Francisco, San Francisco, CA 94143, USA. <sup>101</sup>School of Medicine and Pharmacology, University of Western Australia, Perth 6009, Australia. <sup>102</sup>Centre for Kidney Research, School of Public Health, University of Sydney, Sydney 2006, Australia. <sup>103</sup>Wellcome Trust Centre for Human Genetics, Oxford University, Oxford OX3 7BN, UK. <sup>104</sup>Department of Epidemiology and Prevention, Wake Forest School of Medicine, Winston-Salem, NC 27517, USA. <sup>105</sup>Max Planck Institute for Molecular Genetics, Berlin 14195, Germany. <sup>106</sup>Max Planck Institute for Human Development, Berlin 14195, Germany. <sup>107</sup>Institute of Human Genetics, Helmholtz Zentrum München – German Research Center for Environmental Health, Neuherberg 85764, Germany. <sup>108</sup>Buck Institute for Research on Aging, Novato, CA 94945, USA. <sup>109</sup>Leonard Davis School of Gerontology, University of Southern California, LA, CA 90089, USA. <sup>110</sup>Geriatrics Research and Education Clinical Center, Baltimore Veterans Administration Medical Center, Baltimore, MD 21201, USA. <sup>111</sup>Institute of Translational Medicine, University of Liverpool, Liverpool L69 3BX, UK. <sup>112</sup>Center for Aging and Population Health, University of Pittsburgh, Pittsburgh, PA 15261, USA. <sup>113</sup>Oregon Health & Science University, Portland, OR 97239, USA. <sup>114</sup>Department of Clinical Genetics, Erasmus MC, Rotterdam 300 CA, The Netherlands. <sup>115</sup>Centre for Medical Systems Biology and Netherlands Consortium on Healthy Aging, Leiden RC2300, The Netherlands. <sup>116</sup>Institute for Molecular Medicine Finland (FIMM), University of Helsinki, Helsinki 00251, Finland. <sup>117</sup>Department of Medical Genetics, University of Helsinki and University Central Hospital, Helsinki FI00014, Finland. <sup>118</sup>Human Genetics and Computational Medicine and Bioinformatics, University of Michigan, Ann Arbor, MI 48109, USA. <sup>119</sup>Department of Medicine, Indiana University School of Medicine, Indianapolis, IN 46202, USA. <sup>120</sup>Diabetes and Obesity Research Program, University of Helsinki, Helsinki FI00014, Finland. <sup>121</sup>Estonian Genome Center, University of Tartu, Tartu, Estonia. <sup>122</sup>Faculty of Medicine, Department of Public Health, University of Split, Split 21000, Croatia.

<sup>123</sup>Department of Endocrinology and Diabetes, Sir Charles Gardiner Hospital, Perth 6009, Australia. <sup>124</sup>Molecular Medicine Centre, MRC Institute of Genetics and Molecular Medicine, Western General Hospital, Edinburgh, Scotland EH4 2XU, UK. <sup>125</sup>Hjelt Institute, University of Helsinki, Helsinki, Finland. <sup>126</sup>Wellcome Trust Sanger Institute, Wellcome Trust Genome Campus, Hinxton CB10 1SA, UK. <sup>127</sup>Department of Medicine, University of California at Davis, Sacramento, CA 95817, USA. <sup>128</sup>Institute for Translational Genomic and Population Sciences, Los Angeles Biomedical Research Institute and Department of Pediatrics, Harbor UCLA Medical Center, Torrance, CA 90502, USA. <sup>129</sup>Department of Preventive Medicine, University of Tennessee Health Science Center, Memphis, TN 38163, USA. <sup>130</sup>Department of Genetics and Genomic Science, Institute of Genomics and Multiscale Biology, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA. <sup>131</sup>Department of Endocrinology and Metabolism, Landspítali, The National University Hospital of Iceland, Reykjavik 101, Iceland. <sup>132</sup>Center for Translational Pain Medicine, Department of Anesthesiology, Duke University Medical Center, Durham, NC 27110, USA. <sup>133</sup>Geriatric Research and Education Clinical Center (GRECC) - Veterans Administration Medical Center, Baltimore, MD 21201, USA. <sup>134</sup>Department of Epidemiology and Biostatistics, and the EMGO Institute, VU University Medical Center, Amsterdam BT1081, The Netherlands. <sup>135</sup>Department of Medicine, McMaster University Medical Center, Hamilton, ON, Canada L8N 3Z5. <sup>136</sup>Department of Pathology, Stony Brook School of Medicine, Stony Brook, NY 11794, USA. <sup>137</sup>Department of Neuroscience and Preventive Medicine, Danube-University Krems, Krems 3500, Austria. <sup>138</sup>Diabetes Research Group, King Abdulaziz University, Jeddah 12589, Saudi Arabia. <sup>139</sup>Dasman Diabetes Institute, Dasman 15462, Kuwait. <sup>140</sup>Department of Medicine and Internal Medicine, Centre Hospitalier Universitaire Vaudois (CHUV), Lausanne CH-1011, Switzerland. <sup>141</sup>Department of Epidemiology and Environmental Health, University at Buffalo, State University of New York, Buffalo, NY 14214, USA. <sup>142</sup>Institute of Cellular Medicine, Newcastle University, Newcastle upon Tyne NE2 4HH, UK. <sup>143</sup>Genetics of Complex Traits, University of Exeter Medical School, Exeter EX1 2LU, UK. <sup>144</sup>Institute of Medical Informatics, Biometry and Epidemiology, Chair of Epidemiology, Ludwig-Maximilians-Universität, Munich 81377, Germany. <sup>145</sup>Institute of Medical Statistics and Epidemiology, Technical University, Munich 81675, Germany. <sup>146</sup>Department of Epidemiology, University of Alabama at Birmingham, Birmingham, AL 35294, USA. <sup>147</sup>NIHR Cardiovascular Biomedical Research Unit, Royal Brompton and Harefield NHS Foundation Trust and Imperial College, London SW3 6NP, UK. <sup>148</sup>Imperial College Healthcare NHS Trust, London W2 1NY, UK. <sup>149</sup>Institute of Epidemiology I, Helmholtz Zentrum München - German Research Center for Environmental Health, Neuherberg 85764, Germany. <sup>150</sup>Department of Medicine and Department of Medical and Molecular Genetics, Indiana University School of Medicine, Indianapolis, IN 46202, USA. <sup>151</sup>Departments of Medicine, Epidemiology, and Health Services, Cardiovascular Health Research Unit, University of Washington, Seattle, WA 98101, USA. <sup>152</sup>Kaiser Permanente Washington Health Research Institute, Washington, Seattle, WA 98101, USA. <sup>153</sup>Medical Genetics, GlaxoSmithKline, Philadelphia, PA 19112, USA. <sup>154</sup>The Charles Bronfman Institute for Personalized Medicine, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA. <sup>155</sup>Institute of Child Health and Development, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA. <sup>156</sup>The Genetics of Obesity and Related Traits Program, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA. <sup>157</sup>Department of Preventive Medicine, Icahn School of Medicine at Mount Sinai, New York, NY 10029, USA. <sup>158</sup>Faculty of Medicine in the Galilee, Bar-Ilan University, Safed 1311502, Israel. M. Carola Zillikens, Serkalem Demissie, Yi-Hsiang Hsu and Laura M. Yerges-Armstrong contributed equally to this work. David Karasik, Tamara B. Harris, Claes Ohlsson and Douglas P. Kiel jointly supervised this work